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August 7, 2003

OFFICIAL FILE COPY
File Name: USS Minntac - Tailings
File # MN 0057207
Section # 516 Staff

Mr. John Elling
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155

RE: **Schedule of Compliance Mitigation Goal Evaluation Results**

Dear Mr. Elling:

This letter presents the results of Minntac's evaluation of appropriate sulfate mitigation goals to include in the current draft language for the Schedule of Compliance (SOC) amendment. The evaluation was conducted through the use of Qual2E water quality modeling techniques using inputs and assumptions discussed and agreed to in our meeting at MPCA headquarters on July 23, 2003, and as outlined in your letter dated July 31, 2003.

As MPCA and Minntac have agreed, the mitigation goal in the current draft language of the SOC should be based on the tolerable sulfate level in 020 and 030 seep water that could be discharged under 7Q10 flow conditions while maintaining compliance with the downstream secondary drinking water standard of 250 mg/L for sulfate. As you know, these standards are applicable at the Dark River trout stream headwaters and the Pike River inlet at Lake Vermilion.

The following are the results of our mitigation goal evaluations.

Discharge Location	Mitigation Goal
020 Seep (Dark River)	718 mg/L
030 Seep (Sandy River)	486 mg/L

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Co./Dept.	Co.	
Phone #	Phone #	
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It is our opinion that the final amended SOC agreement should include separate mitigation goals for the 020 and 030 seeps since two distinct hydrologic evaluations were conducted to evaluate mitigation goal values for the separate Dark and Sandy River watersheds. Based on the results presented above, we propose that the mitigation goals will be to decrease the 020 and 030 seep sulfate levels to 718 mg/L and 486 mg/L respectively by December 2011.

In your July 31st letter, you indicated that MPCA may apply "safety factors" to the SOC mitigation goals proposed by Minntac. It is our understanding that the purpose of the SOC mitigation goal is to define a target by which the effectiveness of the sulfate-reducing packed-bed bioreactor (SPB) technology will be evaluated. Thus, we do not understand MPCA's rationale for potentially applying a safety factor to a goal that was derived for this purpose.

Attached is a memo from Barr Engineering that is intended to outline the conservative aspects of the Qual2E model inputs. Based on rationale presented in the attached memo, it is our feeling that the conservative inputs used in our Qual2E model essentially apply a "built-in" safety factor to the mitigation goal evaluation results. Thus, it is our opinion that applying an additional safety factor is unnecessary.

Please call me at 218/749-7469, if you have any questions or comments.

Sincerely,

David S. King, P.E.
Environmental Engineer

Attachment

Cc: Scott Vagle, Tom Moe, Larry Salmela, and Jim Volanski (USS)
George Pruchnofski, Barr Engineering

BARR

Memorandum

To: Dave King
From: Keith Pilgrim
Subject: Conservative Inputs to the Qual2E Model
Date: 8/4/2003
Project: 23/69 703 003 800
c: George Pruchnofski

This memo presents a discussion of the conservative nature of the Qual2E model for the Dark and Sandy Rivers that we indicated we would develop during the conference call with MPCA on July 31, 2003.

USS Minntac and MPCA are in the process of deciding sulfate concentration based mitigation goals for seepage from the Minntac tailings basin to the Dark and Sandy Rivers to include in a new SOC agreement. Barr has developed a Qual2E model for each river based on available monitoring information. The models were used to estimate seepage sulfate concentration goals to meet the 250 mg/l sulfate concentration standard at 7Q10 flow conditions at the location the concentration standard applies. The models predict that the 250 mg/L sulfate criteria will be met at a sulfate concentration of 716 mg/l for seepages to the Dark River watershed seepage and 486 mg/l for seepages to the Sandy River watershed seepage are acceptable: During the July 31 conference call, questions arose regarding the need to apply a safety factor to the modeling results given the conservative nature of the models. Barr agreed to provide this memorandum describing how the models area conservative.

To: Dave King
From: Keith Pilgrim
Subject: Sampling to Support Water Quality Modeling
Date: March 19, 2002
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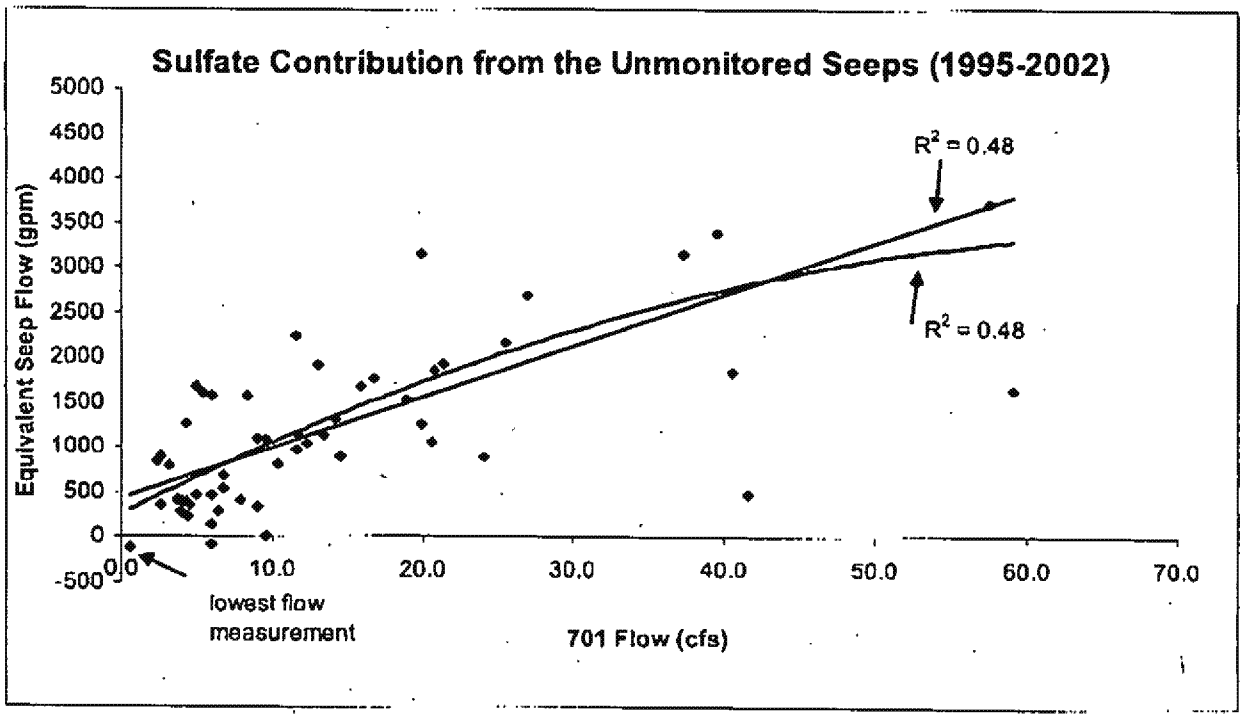
Sandy River

Barr believes the existing Sandy River model is highly conservative for predicting sulfate impacts during low flow conditions. This is supported by the following analyses.

- A linear regression of Sandy River flow (at the 701 monitoring point) and the contribution of sulfate from the unmonitored seeps of the tailings basin (expressed as Equivalent Seep Flow) was developed so that an estimate of sulfate contributed by the unmonitored seeps could be determined under 7Q10 river flow (see Figure 1). The linear regression line has a Y intercept of 436 GPM, meaning that when stream flow is zero, the model assumes that the stream is still receiving 436 GPM of flow from the unmonitored seeps. Other non-linear regression lines could have been fit to the data and would have resulted in a less conservative model. For example, a polynomial regression line would have predicted that Equivalent Seep Flow approaches more near zero as stream flow went to zero. This regression curve would have predicted that the equivalent seep flow would have been 316 GPM at 7Q10. The linear extrapolation to the Y axis is a very conservative method of estimating unmonitored seep loading under 7Q10 flow. The linear regression approach was selected over other regression approaches with the intent of being conservative.
- From the period of record analyzed, the lowest flow measurement at 701 was 0.58 cfs on May 6, 1998 (based upon watershed area, the 7Q10 flow at 701 is 0.72 cfs). On May 6 the sulfate concentration at 701 was 171 mg/L. Based upon contributing watershed area, it is expected that the sulfate concentration at Lake Vermillion would have been approximately 60 mg/L for this low flow event. In addition, the calculated equivalent seep flow for May 6, 1998 was less than zero (see Figure 1) implying that little if any unmonitored seepage was actually entering the river during this time. Thus the linear regression provides a high level of conservatism when compared to this real low flow situation.
- Based upon monitoring at 701 from 1995 to 2002, it does not appear that discharges from the Minntac tailings basin have resulted in sulfate levels over 250 mg/L at Lake Vermillion. The highest sulfate concentration recorded at 701 (when there was corresponding flow data) for this time period was 647 mg/L in February 2000. On this day, flow at 701 was 2.31 cfs. At the S-2 monitoring point (the former USGS gauging station location) the sulfate

concentration was 261 mg/L. It is estimated that the sulfate concentration would have been approximately 156 mg/L at Lake Vermillion for this day. This suggests that even under current tailings basin loads to the Sandy River and during winter conditions that approach low flow, the impacts to Lake Vermilion are well below levels of concern. Therefore, there is no need to add an additional safety factor to the model.

Based upon the above evidence, the sulfate SOC mitigation goal of 486 mg/L is already based upon very conservative estimates of sulfate loading from the tailings basin, and at this discharge concentration it is very unlikely that the sulfate levels at Lake Vermillion would exceed 250 mg/L at 7Q10 river flow conditions.



Dark River

Barr believes the Dark River model has a fair degree of conservatism during low flow conditions based on our knowledge of how unmonitored seeps function in the Sandy River watershed. In other words, during low flow conditions we believe the wetlands are storing water and under high flow

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conditions this water is flushed to the river. It is possible that the unmonitored seep loading would be less than we expect based upon the data we currently have (the available data for the Dark River does not include low flow conditions) .